

# AIRCRAFT ACCIDENT REPORT

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**ADOPTED:** April 18, 1961**RELEASED:** April 24, 1961

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PIEDMONT AIRLINES, DOUGLAS DC-3, N 55V, ON BUCKS ELBOW MOUNTAIN,  
NEAR CHARLOTTESVILLE, VIRGINIA, OCTOBER 30, 1959

## SYNOPSIS

About 2040, October 30, 1959, Piedmont Airlines Flight 349 crashed on Bucks Elbow Mountain located about 13 miles west of the Charlottesville-Albemarle County, Virginia, Airport. The crew of 3 and 23 of 24 passengers were killed; the sole survivor was seriously injured. The aircraft, a DC-3, N 55V, was demolished by impact.

From the available evidence it is the determination of the Board that this accident occurred during an intended instrument approach. More specifically, it occurred during the inbound portion of the procedure turn which was being flown 8 to 11 miles west of the maneuvering area prescribed by the instrument approach procedure.

The Board concludes that the lateral error resulted from a navigational omission which took place when the pilot did not turn left about 20 degrees in conformity to V-140 airway at the Casanova omni range station. Consequently, when the pilots believed the flight was over the Rochelle intersection it was in fact 13 miles northwest of that position. As a result of this position, when the pilot turned left and flew the heading normally flown from Rochelle intersection, the path of the aircraft over the ground was displaced 8 to 11 miles west of the prescribed track. The Board further concludes that the error was undetected because tracking and other instrument approach requirements were not followed precisely.

From information regarding the personal background of Captain Lavrine and expert medical analysis of this information, it is the Board's opinion that preoccupation resulting from mental stress may have been a contributing factor in the accident cause.

## Investigation (See Attachment A for reference)

Piedmont Airlines Flight 349 was a regularly scheduled flight between Washington, D. C., and Roanoke, Virginia, with intermediate stops at Charlottesville and Lynchburg, Virginia. On October 30, 1959, the assigned flight crew consisted of Captain George Lavrine, First Officer Bascom Haley, and Purser George Hicks.

The aircraft departed Washington at 1949.<sup>1/</sup> It was about 20 minutes behind schedule, the result of traffic, ground, and ramp delays. The flight was according to an instrument flight plan and clearance which specified a routing over airway V-140 and a cruising altitude of 4,000 feet.<sup>2/</sup> At departure the gross takeoff weight of DC-3, N 55V, was 25,346 pounds, which was also the maximum allowable weight. The load was properly distributed.

The flight made a Georgetown departure and then proceeded to the Springfield, Virginia, radio beacon where it entered V-140 airway. It followed the airway from Springfield to the Casanova omni range station. The centerline of the airway over this segment is defined as the 260-degree radial of the Casanova omni. At 2012<sup>3/</sup> Flight 349 reported that it was over Casanova at 2010. It also reported it was at 4,000 feet and estimating the Rochelle intersection at 2024, with Charlottesville next.

At Casanova, V-140 airway turns left and from Casanova to the Rochelle intersection the airway is defined as the 239-degree radial of Casanova omni; the distance is 31 miles.<sup>4/</sup> The Rochelle intersection is the 239-degree radial of the Casanova omni and the 335-degree radial of the Gordonsville omni.

About 2018 Flight 349 made a routine inrange report to the Piedmont ground radio station located at the Charlottesville Airport. The flight informed the company that it was in range, IFR (instrument flight rules), and would have 250 gallons of fuel on board when it departed Charlottesville for Lynchburg. The radio operator furnished the flight the latest altimeter setting, 30.47, and the current surface wind which was calm. Normally, the operator would also furnish the latest ceiling and visibility observation. This, according to his testimony, he failed to do. The current observation at this time was Ceiling, measured 1,500 feet broken, 4,000 feet overcast; visibility 10 miles.

Immediately after 2025 the flight reported to the Washington Air Traffic Control Center that it was over the Rochelle intersection at 2025 at 4,000 feet and estimating the Charlottesville Airport at 2030. Washington Center acknowledged and cleared Flight 349 for an instrument approach. About one minute later the flight informed the center as follows, "You can put us out of four thousand." This was the last transmission from the aircraft.

Investigation revealed the weather observations for Charlottesville were. at 1900, 1,700 feet scattered, ceiling 4,000 feet, overcast, visibility 10 miles; at 1930, ceiling 1,700 feet broken, 4,000 overcast, at 2000, ceiling measured 1,500 feet broken, 4,000 feet overcast, visibility

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<sup>1/</sup> All times herein are eastern standard based on the 24-hour clock.

<sup>2/</sup> Altitudes are mean sea level unless otherwise stated. Weather reports of ceiling and cloud levels are feet above the ground.

<sup>3/</sup> Reporting times were determined by timing the recordings of the transmissions and are accurate within one minute. Voice identification from the recordings showed the radio transmissions were made by First Officer Waley, thus indicating that Captain Lavrine was flying the aircraft.

<sup>4/</sup> Distances are nautical miles.

10 miles, wind calm; at 2100, ceiling measured 1,500 feet broken, 2,400 feet overcast, visibility 10 miles, wind calm. A study of the weather observations from other stations in the area showed the Charlottesville conditions should have been substantially as reported. The situation, however, showed that conditions would be much worse in the area near and parallel to the mountains west of Charlottesville. In this area the mountains were obscured and visual flight would not have been possible.

Studies of the winds aloft by the U. S. Weather Bureau showed that at altitudes used by Flight 349 they were predominantly southerly and averaged about 15 knots.

When the flight did not land as anticipated a radio search was made, which proved futile. A ground search was begun as quickly as possible and supplemented by an air search the next day. Throughout that day both were seriously hampered by bad weather. On November 1, about 0800, the wreckage was sighted from a helicopter on the southern slope of Bucks Elbow Mountain, which is located about 13 miles west of the Charlottesville Airport. It was almost hidden by dense tree cover.

Investigation at the scene showed the aircraft crashed where the upslope of the 3,100-foot mountain was nearly 30 degrees. It crashed against the rocky slope on a magnetic heading of 340-350 degrees and at an elevation of approximately 2,600 feet. Initial contact occurred when the right wing of N 55V struck and cut through several trees which progressively tore off the right wing outboard of the landing light. At initial impact the right wing was down about 10 degrees from level and the aircraft was descending slightly. The aircraft was yawed to the right and rolled to the right when, about 180 feet farther, it crashed against the upslope.

In the final impact the forward fuselage rearward to the center section was destroyed. The fuselage was broken from the center section and displaced to the left so it rested on the left wing outboard of the attach angle. The fuselage was also cocked to the left about 45 degrees relative to the center section. Most of the fuselage from over the center section rearward to the cabin door was destroyed or badly crushed. All of the passenger seats were torn from the floor, including the one in which the surviving passenger remained fastened when he was thrown clear of the fuselage.

The structural investigation determined that the landing gear was extended at impact and the flaps were fully retracted. Also, although the aircraft sustained great damage, it was reliably determined that there was no malfunction or failure of the aircraft prior to impact.

Examination of the engines and propellers disclosed no evidence of malfunction prior to impact. Evidence showed that both engines were operating and developing appreciable power when the aircraft struck the mountain, the specific amount of power, however, could not be determined. Evidence also showed that at that time both propellers were capable of normal operation. Examination and bench checks where required showed the engine accessories were capable of normal operation before the impact.

Mr. Phil Bradley, the sole survivor, stated that the flight seemed perfectly normal until the crash. His description of the weather indicated that except for the initial portion, the flight was made in instrument weather conditions. He noted this when he periodically peered through the cabin window from his seat. He also noted reflected light from the anticollision light. Mr. Bradley stated the flight was a little rough and except for a short period following takeoff the "fasten seat belt" sign was on until the crash.

The survivor stated there was no indication of any difficulty. He said the cabin lights were on and the engines sounded normal. He said that a few minutes before and at the time of the crash the cabin was quiet and all passengers were seated. He said both pilots were in the pilot compartment and the purser was attending to his duties.

Mr. Bradley said the plane made several turns, although he was not sure of the amount or direction. One such turn, and seemingly the largest, occurred a few minutes before the crash. He, at first, thought the turn was about 180 degrees but later felt it was more in the order of 90 degrees.

The witness said he had just folded his arms and was looking at his wrist watch when the crash occurred, it was 2040. He said his watch was an accurate timepiece and he had checked it against an airport clock earlier that day. In this connection, other watches were recovered and some had been impact stopped. These showed various times which bracketed 2040.

The approach procedure for the Charlottesville Airport is an ADF (automatic direction finder) procedure performed on a Piedmont-owned and operated homer beacon facility. The night landing minima for Piedmont DC-3 aircraft are. Ceiling 400 feet, visibility 1 mile.

The current Federal Aviation Agency (FAA) approach procedure as applicable to Flight 349 would begin at the Rochelle intersection. According to the procedure in effect at the time of the accident, when Rochelle was reached the flight would transition off V-140 airway in a left turn to a heading of 212 degrees. It would then establish and fly a 212-degree track to the Charlottesville (CHO) homer beacon, which transmits on 284 kcs. As an additional aid, though not required, the company owns and operates another homer beacon, Earlyville (EVL), which transmits on 266 kcs. Charlottesville, the outer homer, is located 4.3 nautical miles from the approach end of runway 3 and about 15.5 miles from the Rochelle intersection.

In normal execution of the instrument procedure most Piedmont pilots use both homer facilities, tuning one ADF to the Charlottesville homer, 284 kcs., and the other to the Earlyville beacon, 266 kcs. In addition, many of the pilots also check passage of the Charlottesville homer by using the Gordonsville omni, set to the 287-degree radial which passes through the homer. Some, at the same time, also check passage of the Earlyville facility by using the second omni set, tuned to the 301-degree radial of Gordonsville.

When Board investigators attempted to plot the Rochelle intersection and airport locations, it was noted that the magnetic heading from Rochelle to the Charlottesville homer, as depicted on the ACA Form 511 and thus on the

approach plate, was in error. The correct heading should have been 201 degrees instead of 212. The error resulted from not amending the heading when, several months earlier, the course of V-140 airway was shifted slightly. In this accident the error loses significance because, according to the flight plan for Trip 349, the correct heading was used. Further, the use of tracking procedures in flight would eliminate the effect of the erroneous heading. Nevertheless, the attention of both the FAA and the company was immediately directed to the error for correction.

According to the instrument approach procedure, upon reaching the Charlottesville homer beacon an outbound track of 207 degrees should be flown, normally for 1 to 1-1/2 minutes. This is followed by a standard procedure turn on the southeast side of the track. Using the standard procedure turn, the outbound heading is 162 degrees and the inbound heading is 342 degrees. The final approach track to the airport is 027 degrees.

Descent below 3,000 feet is not authorized prior to the final approach; then a descent is permitted to not less than 2,200 feet before reaching the Charlottesville homer. Thereafter, descent may be continued to the authorized minimum altitude of 1,039 feet, or 400 feet above airport elevation.

From the Rochelle intersection the entire instrument approach to landing in the DC-3 takes approximately 15 minutes. From Rochelle to the inbound heading of the procedure turn about 10-11 minutes' time is normally required. It appears important to note that based on the reported time of Flight 349 over Rochelle, 2025, and the crash time indicated by Mr. Bradley, 2040, the elapsed time was approximately 15 minutes.

Although the radio and navigational equipment from N 55V was badly damaged and some portions were destroyed, information which was important to the investigation was available. Examination of the omni equipment disclosed that both receivers were tuned to 115.3 mcs., the Gordonsville omni range frequency. It was also learned that the right omni bearing indicator was set to select the 301-degree radial or, as previously indicated, the radial which passes through the Earlyville homer. The radial selected on the other unit could not be determined.

Examination of the various components of the red and green ADF units disclosed both receivers were positioned to select band 1, the 200-410 kc. range. It was determined that the red ADF unit was tuned to 265 kcs., or approximately the frequency of the Earlyville homer, 266 kcs. Impact damage to the green ADF made the most reliable indication of the frequency setting the position of the frequency selector. This, slightly damaged and locked in position, was set on 286 kcs., or close to the frequency of the Charlottesville homer, 284 kcs.

Examination of the ADF loop assemblies revealed that the position of the red ADF loop was equivalent to a bearing of 91 degrees on the cockpit needle. On the same basis the green ADF was positioned on a bearing of 112 degrees. The loop positions are most reliable as to the positions of the needles on the ADF instrument; however, this cockpit instrument, except the face, was destroyed. It is significant that with the aircraft on the crash heading of about 345 degrees the bearings of 91 and 112 degrees extended from the crash site pass very

close to the Earlyville and Charlottesville homer locations, respectively. Further, the 21-degree angle between the loop bearings extended from the accident site to the radio facilities subtend an arc equal in miles to the distance between the homers.

Both aircraft altimeters were found. The right indicated an altitude of 9,200 feet and was set to a barometric setting of 30.43. The left instrument showed about 2,520 feet and a barometric setting of 30.40. The elevation of the accident location was 2,600 feet. The last altimeter setting given the flight was 30 47. Other flight instruments were damaged to such an extent that no useful information was obtained.

An exhaustive flight check was made of all of the various navigational ground facilities pertinent to Flight 349. The checks were made to determine what, if any, condition existed which might have led the flight into the mountain, or if the facilities were functioning within FAA operating standards. To this end nearly 25 hours were flown on the facilities. The checks were flown shortly after the accident and at various times, night and day, thereafter. With Board investigators aboard, they were flown by the FAA Flight Inspection Branch using an especially equipped aircraft for the purpose, by the FAA Air Carrier Branch, and by Piedmont in its own equipment. No discrepancies were found.

In addition, at the request of the Board the Federal Communications Commission entered the investigation. With special equipment and expert personnel, investigation was made to determine if there existed any ground phenomena, including the operation of electronic equipment in the local area, which could adversely affect the normal operation of the facilities. Signal strength for proper reception was measured in appropriate areas, a search for a reported unauthorized homer was conducted, and the possibility of spurious radio signals was investigated. After the work was completed, the spokesman for the FCC team said nothing was found which would preclude or seriously impair the normal operation of the approach facilities.

An intense search resulted in the finding of a series of groundwitnesses who had heard a low-flying aircraft. Because of weather conditions, consistently described as cloudy and foggy, none had seen the airplane but a flight pattern based upon the aircraft engines' sound was revealed. For several reasons the soundpath was attributable to Flight 349. Most important of the reasons was that the sound proceeded to and stopped abruptly in the accident area. Other reasons were the coincidence of time when the aircraft was heard with the estimated progress of Flight 349, the knowledge that no other known aircraft operated coincident with the soundpath, and to some degree the correlation between the sound movement and Mr. Bradley's recollections. Because the path was 8-11 miles west of the airport, a final reason was added when at least three persons on the airport specifically listening for Flight 349 stated they did not hear it.

The aircraft was heard by the series of witnesses between 2020-2045. The first of the series were located 8-10 miles northeast of the accident location. One of them, located on high terrain near Gibson Mountain, stated the aircraft passed over on a westerly heading and it was so low "it rattled the trees." Other witnesses were positioned along a south-southwest line

which was approximately parallel to but 8-11 miles west of the normal approach path from Rochelle to the airport. Most of these witnesses said the engines sounded normal but as if the aircraft were low. Several in the area of White Hall, Crozet, and Afton heard the plane approaching from the northeast. They indicated that from the sound the aircraft then made a turn from the southwesterly heading to a northwesterly heading and proceeded in the direction of Bucks Elbow Mountain. The direction of the turn was uncertain. One witness who described the turn said that after the turn the diminishing engine sound stopped quickly but that she heard no sound like a crash. Another, closer to the mountain, heard the aircraft proceed toward the mountain and at 2045 heard a sound like an explosion. Still another stated she had not heard the aircraft but did hear a sound like thunder of short duration. She placed the time after 2035 and before 2040.

### Analysis and Conclusions

Examination of the wreckage of N 55 V revealed no evidence of malfunction or failure of the airframe or powerplants. There was no indication of an in-flight fire, all major components of the aircraft were located in the immediate crash zone, and it was clearly evident that both engines and propellers were capable of normal operation prior to impact. There was nothing found indicating that an emergency existed before the accident. These findings, reached by examination of the available physical evidence, were substantiated by the observations of Mr. Bradley.

For reasons hereinbefore enumerated, the Board is of the opinion that the soundpath developed from the description by several groundwitnesses was made by Flight 349. From the soundpath information it is apparent the aircraft approached the accident location on a southwesterly course approximately parallel to the prescribed instrument approach path from the Rochelle intersection to the Charlottesville homer, but 8 to 11 miles west of the normal track. The information shows that the southwesterly course was maintained to the Crozet area located 8 to 11 miles abeam of the designated area for the instrument approach procedure turn. It is clearly apparent that in the Crozet area the flight executed a turn from its southwesterly heading to a northwesterly heading. By its amount and its north-south orientation, this turn was coincident with the turning portion of the procedure turn immediately prior to the inbound heading of 342 degrees.

After the turn the flight flew northwest for, as near as can be determined, a distance of two to four miles and crashed against the side of Bucks Elbow Mountain. It crashed on approximately the heading of the inbound portion of the procedure turn with the landing gear extended. The elevation of the crash, however, was approximately 400 feet below the altitude specified for the procedure turn.

From all this evidence it is most apparent to the Board that the accident took place while the general maneuvering requirements of the instrument approach were being flown 8 to 11 miles west of the designated maneuvering area prescribed for the approach.

Because it was apparent that the flight flew a ground track well west of the desired track, a major investigatory effort was centered on the possibility

that faulty operation of ground navigational and instrument approach facilities caused or contributed to the erroneous flightpath. This effort included exhaustive flight and ground checks. The company and the Air Carrier Branch of the FAA made several inspection flights, each using its respective aircraft. In addition, the Flight Inspection Branch of the FAA made evaluations of the airway and approach facilities using specific procedures and an aircraft equipped for the purpose. This work revealed normal operation of the facilities.

As part of this phase the Board called upon the Federal Communications Commission to assist. With special equipment and qualified personnel the FCC team made a comprehensive investigation covering a wide range of considerations relative to the performance, reliability, and installation of the homer beacons. Included were a search for an unauthorized homer rumored to be in operation, an investigation of electronic equipment used by local manufacturers, and an evaluation of signal strength within the operational range requirements specified for the homer beacons.

This phase of the investigation revealed no condition which would impair flight conformity along V-140 or the execution of a normal instrument approach on the homer facilities.

As previously described, the airborne navigational equipment was determined by physical evidence to have been properly tuned for an instrument approach utilizing the ADF equipment on which the Charlottesville approach was based. Because of this it was of primary concern to the investigation whether or not the ADF cockpit presentation was accurate. Most important in this determination were the positions of the ADF loops relative to the crash heading and location. The extended bearings of the red and green ADF loop positions passed nearly through the location of the respective homer beacon to which each was tuned. Also, the angle formed between the bearings subtended an arc at the homers equal to the distance between them. The Board does not believe these loop positions to be a matter of coincidence but rather direct evidence the ADF's were functioning normally at the time of the accident. Furthermore, the elapsed time between reporting Rochelle to the crash apparently exceeded the normal elapsed time from Rochelle to the inbound heading of the procedure turn by several minutes. Believing the flight operated in instrument weather conditions and made the final turn abeam of the procedure turn area, it is probable the turn was started with reference to the ADF indications. The Board considers it improbable that the ADF presentation would be accurate in showing the aircraft abeam of the facilities and inaccurate shortly before this indication. It is equally improbable that such inaccuracy would be followed by an accurate presentation at the time the crash occurred.

Based on the work performed and the evidence found, it is the opinion of the Board that this accident occurred for operational reasons. Consequently, the Board sought a determination in this area which would account for the flightpath of the aircraft being parallel to, but 8 to 11 miles west of, the proper track. It sought a situation which could develop easily and, because it is probable that Captain Lavrine was flying, one which escaped observation by Copilot Haley. It also sought a situation in which the precarious lateral error would not be readily detected as such by either pilot. Because of a number of unknown elements and the inherent intangibles of the operational



situation, it is doubtful that any analysis can determine the sequence of events with complete definitiveness. Nevertheless, the Board believes it reached a determination which best satisfies the aforesaid requisites and the known factors.

It is the opinion of the Board that the laterally erroneous flightpath developed from an initial navigational error at the Casanova omni. It is believed it occurred as an omission in that the flight did not turn in conformity with the V-140 airway from the inbound radial of 260 degrees to the outbound radial of 239 degrees, a left turn of about 20 degrees. It is believed that the flight continued on the 260-degree radial until it reached the 335-degree radial of the Gordonsville omni at a location approximately 13 miles northwest of the Rochelle intersection. It is the Board's opinion that at this location, which was believed by the pilots to be Rochelle, the flight turned left to and flew the approximate heading indicated by the flight plan and log to be flown from Rochelle, 200 degrees.

The Board has reached its opinion as to the sequence of events based upon several factors. The first was the results of an analytical time, distance, and groundspeed plot. It is probable that the flight flew about 15 minutes after reporting Rochelle until it crashed. This time, being considerably longer than the time normally required to fly from Rochelle to the inbound heading of the procedure turn, shows a greater distance must have been flown. A plot of the probable flightpath in reverse was therefore prepared using the time flown, a reciprocal of the soundpath, and the estimated groundspeed of the DC-3. This showed that 15 minutes before the accident the aircraft would have been over an area about 13 miles northwest of Rochelle intersection.

The second phase of this work was a radius of action plot from the Casanova omni. Based on the elapsed time between the Casanova and Rochelle reports, 15 minutes, it was determined that the flight would have flown 33 miles. A line of position with a radius of 33 miles from Casanova was found to intersect the initial plot at a location which was approximately 15 minutes from the crash or again about 13 miles northwest of Rochelle.

At the completion of this work two additional significant factors were apparent. The point of intersection of the plots was closely coincident with the 335-degree radial of Gordonsville. Secondly, the heading to the location of intersecting plots from Casanova was the 260-degree radial of Casanova and the same as the inbound radial to Casanova from Springfield.

At Casanova Copilot Haley made the position report and most probably recorded it in the flight plan and log. Thereafter he would be expected to tune his omni set to the Gordonsville frequency and select the 335-degree radial in order to identify the Rochelle intersection. Considering the small amount of turn required at this time, the first actions could have diverted his attention for the period during which the captain would normally have made the turn. Tuning his omni to Gordonsville, though necessary, would also reduce his opportunity to observe by omni indications the relative position of the aircraft to the course of the airway. Additionally, there was indication that Captain Lavrine flew with a lower than average level of instrument panel illumination. In the Board's opinion these factors are valid reasons in this instance for the copilot not having detected the navigational omission.

After reporting Rochelle and turning to the southwest heading it is likely that both pilots believed the aircraft was describing a groundpath west of, but only a short distance west of, the normal track from Rochelle to the Charlottesville homer. It is the Board's opinion that at this time the flight was, in fact, 13 miles northwest of Rochelle. While this position was only two to three miles farther than Rochelle from the Casanova omni, the position placed the southwest course of the flight eight to nine miles west of the specified track. The location also positioned the flight about 10 miles farther from the homer facilities than from the Rochelle intersection.

It is believed that this latter factor could work to obscure the lateral error which existed during the southwest portion of the flightpath. The greater distance from the signal source would reduce the angular displacement of the ADF presentation. Thus, if the aircraft was positioned 10 miles farther from the signal source than it was believed to be by its pilots, the angular deflection of the ADF presentation caused by the lateral course error could be obscured considerably by the greater distance. For example, the ADF presentation 24 miles from the signal source and eight to nine miles west of track is not alarmingly different than the presentation 12 miles from the signal source and three miles west of the prescribed track. Similarly, the ADF presentation 19 miles from the signal source and eight to nine miles west of track is not alarmingly different than the presentation seven miles from the signal source and three miles west of the track desired. In addition, as the flight progressed toward the facilities but from a greater distance than believed by the pilots, the increasing angular displacement of the ADF needles showing lateral error could be interpreted as a closure on the signal source. The Board believes the foregoing discussion to be a valid consideration in the reason that the pilots were not alerted early in the approach to the large lateral track error.

On the other hand, the Board is aware that as the flight proceeded on the southwest course the rate of progression of the ADF needles to the left 90-degree abeam indication would have been much slower as the result of the greater distance and time to be flown. At the 90-degree position the angular spread between the needles would have been much narrower 9 to 10 miles west of the homers than three to four miles west of the homers. Further, 90 degrees abeam of the signal source, a 20-degree relative bearing change on a flightpath three to four miles west of the homer, would take 30 to 40 seconds as contrasted to approximately 1-1/2 minutes on a flightpath about nine miles west of the homer. In addition, the ADF presentation during the period the flight turned from the southwest heading until it struck the mountain would have been incompatible with a close-in position. The Board believes that these factors should have served to alert an attentive pilot that the lateral course error was of considerable magnitude.

During the course of the investigation the aeronautical history of Captain Lavrinc was reviewed. His training, qualifications, and proficiency reports were satisfactory. His history showed that he had progressed normally to captain and had served in that capacity since May 1957. It also showed that he had flown in and out of Charlottesville and over the route involved for several years on a regular basis. Captain Lavrinc had flown a total of 5,101 hours, of which 4,771 were in DC-3 aircraft.

To the Board there were numerous factors which were obviously inconsistent with Captain Lavrinc's record. Some were. The apparent navigational omission, a nonadherence to precise tracking procedures, and a descent below the authorized procedure turn altitude. Others were. The failure to note that the time for station passage was in excess of that commensurate with a close-in position, and that ADF indications were not compatible with the normal procedure turn presentation. Still others were a failure to request the latest Charlottesville weather when the communicator did not furnish it, and not using the altimeter setting given in response to the inrange report. The Board believes these factors were not only inconsistent with Captain Lavrinc's reputation as an exacting pilot but were indicative of a serious departure from the high standard and quality of performance expected during an instrument operation. Because of these factors a comprehensive investigation was made into the personal background of Captain Lavrinc. This was done to search for reasons which could seriously impair his normal piloting ability. During this work reasons were found which could result in his preoccupation.

Captain Lavrinc had, for several years, been under severe emotional strain. The Board considers that disclosure of detailed information relating thereto would adversely affect the interests of certain persons and is not required in the interest of the public. A resume of the Board's significant findings and certain recommendations, however, are in the public interest and are set forth below.

Captain Lavrinc received psychotherapy in 1953-1954; he obtained further psychiatric counseling in 1957; intensive psychotherapy was resumed in May 1959, which he underwent several times a week thereafter; his last appointment was the night before the accident. This latter treatment involved the services of two psychiatrists. In the course of this treatment the first psychiatrist prescribed certain psychotropic drugs. After trials on Compazine, Prozine, Sparine, and Thorazine, Prozine was prescribed in August 1959 in a dosage of three or four times daily and was renewed on September 18, 1959. This prescription specified an amount which, if taken as directed, would have been sufficient to last until two days before the accident.

On September 23, 1959, however, Captain Lavrinc commenced psychotherapy under the second psychiatrist who prescribed no drugs. The Board has been unable to determine whether or not Captain Lavrinc continued to take the medicine in the prescribed manner during the latter treatments, although there is evidence that he took the earlier trial prescriptions.

The Board has evaluated the background and history of Captain Lavrinc, including data set forth above. In addition, it submitted all the available information covering Captain Lavrinc to particularly qualified medical experts for evaluation as to its significance with respect to this accident.

The consensus is that Captain Lavrinc was so heavily burdened with mental and emotional problems that he should have been relieved of the strain of flight duty while undergoing treatment for his condition. This condition was such that preoccupation with his problems could well have lowered his standard of performance during instrument flight. Furthermore, with respect to this accident the consensus is that the emotional and mental problems were of far greater importance in causing the preoccupation than could have the use of psychotropic medication.

The Board believes that the facts disclosed by this investigation demonstrate the adverse effects of serious emotional and mental stress on airman proficiency and performance. It further believes that the early recognition and correction of such conditions which might tend to impair an airman's proficiency and performance would be beneficial to flight safety. Accordingly, the Board recommends that the Federal Aviation Agency, appropriate segments of the aviation industry, and the medical profession initiate exploratory studies in this field.

The Board also considers that the investigation of this accident demonstrates the need for reexamination of the use of drugs which may affect the faculties of a flight crew member in any manner contrary to safety.

Since World War II there have been great advances in pharmacology and whole new families of drugs have become easily available to the public, either over the counter or by prescription. Since 1953-1954 one of the most significant advances has been in the field of psychopharmacology. There has been a proliferation of drugs which influence the state of mind, are employed in the treatment of mental disorders, or are used as psychic energizers. Within this group of drugs the so-called tranquilizers are being widely used by the public.

The basic question which the Board believes must be resolved, therefore, is how does the use of these drugs relate to the safety of flight. For example, within the framework of the present Civil Air Regulation covering the use of drugs,<sup>5/</sup> should these drugs be classified as ". . . drug which affects his (crew member) faculties in any manner contrary to safety . . ." The Board is of the opinion that the answer to the question is a qualified "yes." In great part this decision is reached from review of military research into the relationship of drugs to the flying profession. The basic conclusion derived from this research can be stated quite simply: If a flight crew member's personal situation demands tranquilizers he should be removed from flying status while on the drugs.

#### Probable Cause

The Board determines that the probable cause of this accident was a navigational omission which resulted in a lateral course error that was not detected and corrected through precision instrument flying procedures.

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5/ Section 43.45. Use of Liquor, Narcotics, and Drugs. No person shall pilot an aircraft or serve as a member of the crew while under the influence of intoxicating liquor or use any drug which affects his faculties in any manner contrary to safety. A pilot shall not permit any person to be carried in the aircraft who is obviously under the influence of intoxicating liquor or drugs, except a medical patient under proper care or in case of an emergency.

A contributing factor to the accident may have been preoccupation of the captain resulting from mental stress.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ALAN S. BOYD  
Chairman

/s/ CHAN GURNEY  
Member

/s/ G. JOSEPH MINETTI  
Member

/s/ WHITNEY GILLILLAND  
Member

Robert T. Murphy, Vice Chairman, did not take part in the adoption of this report.

## S U P P L E M E N T A L   D A T A

### Investigation and Hearing

The Civil Aeronautics Board was notified of the accident shortly after the flight was presumed to have crashed. Board investigators were immediately dispatched to Charlottesville and participated in the search and rescue activity until the aircraft was located. Thereafter, an investigation was initiated and conducted in accordance with the provisions of Title VII of the Federal Aviation Act of 1958. A public hearing was held in conjunction with the investigation in Charlottesville, Virginia, December 10-11, 1959.

### Air Carrier

Piedmont Airlines is the Airline Division of Piedmont Aviation, Inc. The company is incorporated in North Carolina with its principal offices in Winston-Salem, North Carolina. The Piedmont Airlines Division of the company was established in 1947. It operates under a currently effective certificate of public convenience and necessity issued to the company by the Civil Aeronautics Board and an air carrier operating certificate issued by the Federal Aviation Agency. These authorize the company to transport by air persons, property, and mail over various routes including the one involved in the accident.

### Flight Personnel

Captain George Lavrine, age 32, was employed by Piedmont Aviation January 23, 1950. He was employed in the radio department and transferred to the Airline Division November 24, 1951. He was promoted to reserve captain on May 1, 1957. Captain Lavrine held a valid FAA airline transport pilot certificate with a DC-3 aircraft rating. Company records showed he had flown 5,101 hours, of which 4,771 were in DC-3 aircraft. His last first-class medical was satisfactorily accomplished October 13, 1959. His last semiannual proficiency flight check was satisfactorily accomplished May 26, 1959.

First Office Bascom L. Haley, age 27, was employed by Piedmont Airlines on May 2, 1957. He held a valid FAA commercial pilot certificate with an instrument rating. According to company records he had accumulated 2,858 hours, of which 1,678 were in DC-3 aircraft. His last first-class medical examination was satisfactorily accomplished May 12, 1959.

### The Aircraft

DC-3 N 55V, was manufactured June 2, 1944, and procured by Piedmont Aviation on January 14, 1955. It had been flown a total of 26,339 hours. The aircraft had been flown 83 hours since the last No. 4 inspection. The engines were Pratt and Whitney, model R-1830-92, equipped with Hamilton Standard model 23E50 propellers.

